NOTES ON FRECKLED DUCK *STICTONETTA NAEVOSA* SHOT AT BOOL LAGOON, SOUTH AUSTRALIA, 1980

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Freckled ducks *Stictonetta naevosa* (n = 164) were collected at Bool Lagoon, South Australia, following the opening of the 1980 waterfowl season. Birds were generally sexed and aged, and routine body measurements taken. Wherever possible, the identity of foods, and ectoparasites and endoparasites, was established, and moult and reproductive details were obtained from subsamples. Most ducks were adult; body masses were not low and many birds had extensive fat deposits. In this sample, the birds showed no reproductive activity but maintained body weight and fat reserves, apparently by eating a range of plant and animal foods. Counts and surveys of hunters' activities suggest that Bool Lagoon is a refuge for birds which disperse from normal breeding areas in times of drought.

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The freckled duck *Stictonetta naevosa* is generally distributed in southern Australia, particularly in the south-east and south-west. In South Australia the species is relatively rare, being found primarily in the Murray Valley, Bulloo and Lake Eyre basins, but showing occasional peaks of abundance in other areas (Parker *et al.* 1985, Marchant & Higgins 1990). Indeed, much of the population in eastern Australia may originate from the Lake Eyre basin itself (Parker *et al.* 1985). At times, numbers increase dramatically on some more southern wetlands which are used as refuges rather than breeding habitat. When such concentrations coincide with the annual open season on waterfowl, in South Australia as elsewhere in south-eastern Australia, freckled duck become an illegal part of the harvest. Relatively large numbers of freckled duck have been killed during the earlier parts of some open seasons (*e.g.* in Victoria, Corrick 1980, Corrick 1982, Norman & Norris 1982; in South Australia, Reid 1980), creating concern for the population of this poorly understood species.

Bool Lagoon, South Australia, a state game reserve of 2 690 ha, has *ca* 2 400 ha of open water when full (the adjacent Hacks Lagoon Conservation Park holds some 130 ha of additional wetland). On the opening day of the 1980 waterfowl season (1 March), there were up to 5 000 freckled duck present in the area (Parker *et al.* 1985). This note provides a summary of measurements and details of reproductive activity, parasites and diet obtained from 164 freckled duck carcasses collected at Bool Lagoon on the opening day. When collections were made, *Triglochin procera* was growing through most of the open water and freckled ducks were mainly in or around a large stand of *Melaleuca halmaturorum*, itself inundated by water.

Methods

Carcasses of freckled duck (164) were collected in and around Bool Lagoon on 1 March 1980, either from hunters directly or from the water where they had been left. The birds were dried and frozen until later examination and or preparation as study skins (132). Once thawed, sexes and 'ages' were determined for most birds using gonad examination and the presence or absence of juvenile tail feathers. Many birds (119) were weighed (to 1g), and total body length and wing span (to 1mm, carcass relaxed and extended), wing chord length (to 1mm, gently flattened), length of central tail feathers and tarsus, bill length (feathers to tip) and bill width (at nares) (all to 0.1mm) obtained. Some birds (56) were also examined for the presence of moult in primary and secondary tracts, as well as tail and body tracts generally (here moult was considered as absent, 1; slight – moderate, 2; heavy, 3); wear of primary feathers was also scored (1 – 4, following Braithwaite & Norman 1974). Gonads from a sample of the freckled ducks (92) were drawn to scale; testes lengths were determined from the scale drawings (to 0.5mm), and follicle size in ovaries classified as developed (>3 mm) or not (see Norman & Norris 1982). Oviducts were classified as straight or convoluted. Fat deposits (subcutaneous, peritoneal, anal or thoracic) were considered collectively and assigned to a category (0 = none, 4 = heavy), and the extent of skull ossification was also determined in 58 birds. Body masses, total lengths and wing spans of most birds were obtained within six months of collection, but some freckled ducks were not weighed and measured until 15 – 24 months later. This later sample was used to identify mensural changes under storage conditions.

Ectoparasites were collected from some carcasses by brushing. Food material was removed from 39 gizzards (few birds had complete food items in oesophagi), separated into recognisable taxa and submitted, preserved, for identification. Obvious endoparasites were also collected and preserved, and later identified.

In statistical comparisons below, p values of 0.05 have been accepted as significant unless otherwise indicated and variances examined for equality.

Results

General

Of the 140 freckled duck aged, 128 (91.4%) were considered adult and 12 (8.6%) immature. Of the 146 birds sexed, 93 (63.7 %) were males, a significant departure from unity ($X^2 = 10.959$, df 1, $p < 0.001$) and one more obvious in the adults examined, where 77 (68.7 %) of 112 were males ($X^2 = 15.750$, df 1, $p << 0.001$). However, only two of the 10 birds considered immature were males. Skull ossification was complete in the 58 birds examined and fat deposits (assessed in 89 birds) were usually extensive (54 birds, 60.7 %); there were no birds without fat present (Table 1). There was no significant difference in the extent of fat assessed between adult males or females (Wilcoxon rank sum test).

TABLE 1. Fat deposits in freckled duck examined from Bool Lagoon, South Australia, 1 March 1980. (1 = slight, 4 = heavy; a = includes unaged and or unsexed birds).

		Category of deposit				
		1	2	3	4	Total
Sex/age						
Male	– adult	15	2	9	23	49
	– immature					0
Female	– adult	9	2	3	8	22
	– immature			2	3	5
All birds[a]		31	4	16	38	89

Measurements and body mass details for adult male and female freckled duck are summarised in Table 2, as are data from all birds examined. Adult male birds had significantly longer wings than adult females ($t = 6.601$, df 94, $p < 0.0001$), were longer ($t = 8.9297$, df 39.4, $p < 0.0001$) and had a greater wingspan ($t = 3.2377$, df 100, $p < 0.001$). The males were also heavier than females ($t = 9.7091$, df 93, $p = 0.0001$), had longer ($t = 9.5095$, df 92, $p < 0.0001$) and wider ($t = 4.2004$, df 94, $p = 0.0001$) bills, and longer tarsi ($t = 2.7128$, df 93, $p = 0.0080$). Tail lengths, however, were not significantly different. In neither males nor females were bill widths well correlated with bill lengths. Samples of immature males were insufficient for comparison with adults; however, immature females were shorter ($t = 2.3253$, df 22.4, $p = 0.0295$) than adults. Of the 33 adult female oviducts examined, 30 were convoluted and one slightly convoluted; seven of the eight females considered immature had straight oviducts. None of the 49 ovaries included enlarged follicles. Right testes lengths averaged 7.89 ± s.d. 1.95 mm (n = 43) and the mean left testis length was 10.18 ± 2.22 mm (n = 42). In adult males, respective lengths were 8.11 ± 1.95 (n = 33) and 10.61 ± 2.00 (n = 32) mm.

For adult males, body masses of those weighed late (mean 1 049.1 ± 57.4, n = 15), were similar to those of birds weighed nearer the time of collection (1 059.4 ±81.7, 51), and wing spans also showed no significant difference (t-tests) between the two groups. However, mean total body length was significantly higher ($t = 3.0651$, df 66, $p = 0.0022$) in those adult males measured earlier (575.1 ± 15.6, n = 54) rather than later (561.2 ± 15.6, n = 14). In adult females, there were no such differences.

Wing wear for the 56 birds examined is summarised in Table 3. Few birds of any age or sex group had heavily worn primaries and, of the 49 adults examined, 34 (69.4 %) had wings showing slight to moderate wear. None of the ducks (58) had primary or secondary feathers in moult (absent or growing), only

TABLE 2. Measurements and body mass details (mean ± s.d., range, sample size) for freckled duck collected at Bool Lagoon, South Australia, 1 March 1980. (a = includes unaged and/or unsexed birds).

	Adult male	Adult female	All birds[a]
Body mass (g)	1057.0 (76.55; 900-1230; 66)	889.6 (79.4; 722-1064; 29)	989.9 (119.4; 570-1230; 119)
Wing length (mm)	228.3 (6.6; 209-242; 65)	219.2 (5.3; 206-232; 31)	225.9 (7.8; 206-243; 138)
Total length (mm)	572.2 (16.0; 530-610; 68)	524.3 (27.8; 420-600; 31)	552.9 (32.1; 420-610; 131)
Wingspan (mm)	803.9 (33.4; 715-866; 70)	781.8 (28.6; 730-840; 32)	793.7 (35.8; 670-866; 133)
Tarsus (mm)	44.4 (2.5; 38.0-48.0; 65)	43.0 (2.2; 37.2-46.7; 30)	43.8 (2.5; 37.0-48.9; 142)
Bill length (mm)	56.1 (2.2; 46.2-61.0; 64)	51.6 (2.0; 48.0-56.9; 30)	54.5 (3.1; 46.2-61.0; 141)
Bill width (mm)	16.3 (1.1; 11.8-17.9; 65)	15.4 (0.6; 13.9-17.2; 31)	16.2 (1.1; 11.8-20.5; 143)
Tail length (mm)	68.5 (2.5; 63.2-77.6; 50)	67.6 (2.3; 64.2-73.2; 27)	68.0 (2.4; 63.2-77.6; 103)

eight (of 58) birds had any tail moult but 55 of 60 birds examined for body tract moult showed slight to heavy amounts of replacement underway.

Foods

Food material was sorted into major taxa. Small molluscs (Planorbidae: *Glyptophysa* (= *Physastra*), *Amerianna, Segmentina, Gyraulus* and *Isidorella* spp.; Hydrobiidae: *Fluvidona* sp.; Viviparidae: *Notopala* sp.; Lymnaeidae: *Lymnaea* sp.; the sphaeriid bivalve *Sphaerium tasmanicum*), insects and larvae, ostracods (including *Candonocypris novazealandae*), amphipods and cladocerans were present in most samples, which also included *Chara* sporocarps, seeds of *Chenopodium* spp., *Sarcocornia quinqueflora* and seeds of composites, graminids and angiosperms.

Parasites

Feather lice, the amblycercan *Trinoton querquedulae* (commonly found on waterfowl) and the ischnoceran *Acidoproctus moschatae* (previously recorded only from the red-crested pochard *Netta rufina*, R. Palma, pers. comm., although *Acidoproctus* sp. has been collected from *Stictonetta* examined in Victoria, Van Mourik & Norman 1985), were found on some birds, and the trematode *Echinoparyphium* sp. in others.

TABLE 3. Wing wear in freckled ducks collected at Bool Lagoon, South Australia, 1 March 1980.

	Wing wear category				
	1	2	3	4	Total
Age/sex group					
Adult male	7	10	4	3	24
Immature male	1	1			2
Adult female	2	2	4	1	9
Immature female	1		1	1	3
Unaged/unsexed	2	8	7	1	18
Adults	10	20	14	5	49
Immatures	3	1	1	1	6
All birds	13	21	16	6	56

Discussion

Freckled duck shot at Bool Lagoon in 1980 and examined in this study were considered to be primarily adult birds, which may have previously bred (females), although at the time of collection they had apparently regressed or undeveloped gonads (male testes were of similar size to those from freckled duck shot in Victoria, Norman & Norris 1982; in that sample the testes showed minimal reproductive activity). Most birds also showed well-developed fat deposits, and had a body mass similar (and as high) as those examined in Victoria in 1981, reflecting good physiological condition. As in that study, few ducks from Bool Lagoon had missing or growing tail feathers, primary and secondary feathers were not heavily abraded (and had, for the most part, apparently been replaced some time before the opening day, 1 March), and the incidenee of body moult was extensive. Norman & Norris (1982) concluded that the Victorian sample represented birds congregating at a more permanent wetland, one used as a refuge during drought elsewhere. Freckled duck present at Bool Lagoon in March 1980 were apparently behaving in a similar fashion, concentrating outside the normal breeding range, in a semi-permanent wetland which provided drought refuge.

The freckled duck is largely sedentary but, in drier seasons, as habitat is reduced they disperse to more coastal refuge areas like Bool Lagoon (*e.g.* Frith 1982, Marchant & Higgins 1990). In Victoria, the reporting rate for this species was highest in early summer, and there were no records from May to July (Emison *et al.* 1987). In South Australia too, freckled duck tend to increase in south-eastern wetlands during summer-autumn periods (L. Best, pers. comm.). However, such dispersal is irregular in southern Australia. Bag surveys conducted between 1972 and 1979 (Braithwaite & Norman 1974, 1976, 1977, 1982; Norman *et al.* 1982) showed that few (<1%) of the ducks examined were freckled duck. However, in 1980 the proportion increased to 4.5% in Victoria (Norman & Norris 1982) and at Bool Lagoon too, numbers of freckled duck, as reflected in counts and hunter surveys, were greatest in 1980 (L. Best, pers. comm.). These irruptions apparently follow extensive inland flooding and subsequent drying periods. Parker *et al.* (1985) considered that there was a 5–9 year cycle in irruptions, related to events within the Lake Eyre basin (rather than the Lachlan–Murrumbidgee basin, *cf.* Frith 1982); a major flood occurred in the Eyre basin in 1976, and a minor one in 1977 (Marchant & Higgins 1990). From mid to late 1979, freckled duck numbers increased in south-eastern Australia and many were shot in the 1981 season (Norman & Norris 1982). Numbers at Bool Lagoon increased from September 1979 onwards, and by March 1980 there were up to 5 000 freckled duck present, of which at least 436 (and perhaps as many as *ca* 1 000) were shot (L. Best, pers. comm.; L. C. Jolley, in litt.). Despite this, some 200–300 were present between April and June but few in subsequent seasons (L. Best, pers. comm.).

In the Bool Lagoon area at least, the freckled duck, a specialist feeder (Marchant & Higgins 1990), was able to maintain body weight and fat reserves by taking a range of foods from both plant and animal sources. The species, whose status is unresolved, should be protected at such refuge wetlands.

Acknowledgments

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References

BRAITHWAITE, L. W. & NORMAN, F. I. 1974. The 1972 open season on waterfowl in south-eastern Australia. *CSIRO Division of Wildlife Research Technical Paper* no. 29.

BRAITHWAITE, L. W. & NORMAN, F. I. 1976. The 1973 and 1974 open seasons on waterfowl in south-eastern Australia. *CSIRO Division of Wildlife Research Technical Memorandum* no. 11.

BRAITHWAITE, L. W. & NORMAN, F. I. 1977. The 1975 and 1976 open seasons on waterfowl in south-eastern Australia. *CSIRO Division of Wildlife Research Technical Memorandum* no. 13.

BRAITHWAITE, L. W. & NORMAN, F. I. 1982. The 1977 and 1978 open seasons on waterfowl in south-eastern Australia. *CSIRO Division of Wildlife Research Technical Memorandum* no. 15.

CORRICK, A. H. 1980. Freckled duck on lakes in the Western District, Victoria. *Australian Bird Watcher* 8: 254–255.

CORRICK, A. H. 1982. Records of freckled duck in Victoria from December 1980 to July 1981 and of the number shot on opening day of the 1981 duck season. *Australian Bird Watcher* 9: 260–268.

EMISON, W. B., BEARDSELL, C. M., NORMAN, F. I., LOYN, R. H. & BENNETT, S. C. 1987. 'Atlas of Victorian Birds'. RAOU and Department of Conservation, Forests and Lands: Melbourne.

FRITH, H. J. 1982. 'Waterfowl in Australia'. (Rev. edition). Angus and Robertson: Sydney.

MARCHANT, S. & HIGGINS, P. J. 1990. 'The Handbook of Australian, New Zealand and Antarctic Birds'. Vol. 1. Oxford University Press: Melbourne.

NORMAN, F. I., BRIGGS, S. V. & BRAITHWAITE, L. W. 1982. Some results from the 1979, 1980, and 1981 opening day surveys of waterfowl hunters in New South Wales and Victoria. *CSIRO Division of Wildlife and Rangelands Research Technical Memorandum* no. 20.

NORMAN, F. I. & NORRIS, K. C. 1982. Some notes on freckled duck shot in Victoria, Australia, 1981. *Wildfowl* 33: 81–87.

PARKER, S. A., ECKERT, H. J. & RAGLESS, G. B. 1985. 'An Annotated Checklist of the Birds of South Australia. Part 2A: Waterfowl'. South Australian Ornithological Association: Adelaide.

REID, N. 1980. Requiem for the freckled duck. *The Bird Observer* no. 581: 44.

VAN MOURIK, S. C. & NORMAN, F. I. 1985. Ectoparasites of some waterfowl (Anatidae) from Victoria. *Occasional Papers, Museum of Victoria* 2: 1–3.